

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/17/70 - 4/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Category	COMPUTER EQUIPMENT		
			Identification Number	Agency Annual Amt.		Terminal Access Minutes (K mins)	Pageminutes(K)	Block Storage(K)
Non-Stanford, Medical -- Category 3 (TOTAL)								
Belt, D.	Speech and Hearing				2		at .2 cents per pageminute	at .10 cents per block
Daughters, G.	Palo Alto Medical Research Foundation			None	3	0.0	0.0	0.002
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds	3	5.970	8.352	0.286
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds	3	2.215	3.341	0.409
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds	3	4.612	8.896	1.195
Durbridge, T.	Pathology			None	3	13.375	40.079	0.617
Englander, D.	Pathology			None	3	1.355	3.087	0.868
Ingels, N.	Palo Alto Medical Research Foundation			Foundation Funds	3	0.022	0.051	0.253
Kountz, S.	San Francisco Medical Center			S.F. Medical Center Funds	3	11.427	84.723	1.530
Stewart, L.	Palo Alto Medical Research Foundation			Foundation Funds	3	0.0	0.0	0.013
Tickner, E.	Palo Alto Medical Research Foundation			Foundation Funds	3	0.032	0.058	0.295
Tickner, E.	Palo Alto Medical Research Foundation			Foundation Funds	3	1.045	3.893	0.256
						40.055	152.482	5.724
				SUB-TOTAL				
Student Education,	Medical School -- Category 4 (FREE)						at .1 cent per pageminute	at .10 cents per block
Brast, N.	Medical Student	Calculating descriptive and inferential statistics on experimental data.	*R00311	NIH	4	4.145	10.704	2.177
Britt, R.	Medical Student	Auditory pathway responses to acoustic stimuli.	*R00311	NIH	4	0.007	0.010	0.164
Brody, B.	Medical Student	History taking and formulation of differ- ential diagnoses.	*R00311	NIH	4	1.717	5.695	0.299
Brody, B.	Medical Student	Information processing in sensory systems.	*R00311	NIH	4	0.580	0.808	2.195
Brown, E.M.	Medical Student	Correlating serum levels of therapeutic agents with age, body weight, surface area, etc.	*R00311	NIH	4	1.982	4.612	5.801
Brown, E.W.	Medical Student	Computer instruction in biostatistics.	*R00311	NIH	4	14.397	27.765	1.923
Behanan, B.	Medical Student	Determine whether medical students can learn statistical concepts by computer simulation.	*R00311	NIH	4	22.357	44.540	3.425
* Grant supporting more than one individual user.								

Grant No. R00311-05
Section IX

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/1/70 - 4/30/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Category	COMPUTER EQUIPMENT		Block Storage(K)
			Identification Number	Agency		Terminal Access Minutes (Per Day)	at .1 cent per page/minute	
Student Education,	Medical School -- Category 4 (PRDE)							
Buchanan, B.	Medical Student	Computer instruction for medical students in Genetics Department.	*RRO0311	NIH	4	44,042	105,095	2,052
Calvert, J.	Medical Student	Devising mathematical models to be used for public administration.	*RRO0311	NIH	4	0,252	0,351	1,818
Chester, J.	Medical Student	Calculation of data on tumors in mice.	*RRO0311	NIH	4	11,017	26,978	1,003
Chu, F.	Medical Student	Automatic recognition of cardiac arrhythmias on monitored patients.	*RRO0311	NIH	4	16,345	33,571	1,488
Corby, J.	Medical Student	Relationship between attention and enhancement of averaged evoked response (AER) magnitude.	*RRO0311	NIH	4	18,727	38,480	1,100
Dimsdale, J.	Medical Student	Characterize psychiatric wards on the basis of certain commonly-held values - in particular, goals of therapy.	*RRO0311	NIH	4	6,582	14,714	0,564
Enzmann, E.	Medical Student	Determination of secondary peristalsis of the esophagus.	*RRO0311	NIH	4	7,975	20,521	11,437
Feldman, G.	Medical Student	Monitor airway resistance values during sessions with asthmatic patients and normal subjects.	*RRO0311	NIH	4	3,595	8,534	0,133
Ganel, J.	Medical Student	Indicator dilution techniques for measuring pulmonary blood flow and lung transfer function.	*RRO0311	NIH	4	10,220	26,111	5,921
Gelfan, M.	Medical Student	On-line analysis of cardiac catheterization data.	*RRO0311	NIH	4	3,657	6,490	1,304
Gleason, C.	Medical Student	Self-education: how to use computers in electrophysiological research.	*RRO0311	NIH	4	7,330	42,822	0,803
Gordon, L.	Medical Student	Monte Carlo generation of random variables for examining efficiency of confidence intervals.	*RRO0311	NIH	4	3,575	12,837	0,016
Hahn, P.	Medical Student	Interpretation, quantification, and systematic retrieval of information from gel electrophoreses.	*RRO0311	NIH	4	2,765	14,412	1,179
Harris, R.	Medical Student	Correlation between human emotions and their appraisals of their environment.	*RRO0311	NIH	4	3,502	5,971	2,113
Helikson, M.	Medical Student	Evaluating liver blood flow with radioactive isotopes.	*RRO0311	NIH	4	12,290	41,033	14,956
Jan, W.	Medical Student	Statistical tests on data from laboratory experiments.	*RRO0311	NIH	4	48,522	143,577	1,689
Known, U.N. (Miscellaneous Users)	Medical Student	Minor student desk calculator services; no file storage.	*RRO0311	NIH	4	910,907	2100,288	0,050
Levine, R.	Medical Student	Studies on the complicated kinetics of the carboxymyl phosphate synthetase; search for control mechanism of this enzyme.	*RRO0311	NIH	4	27,030	102,151	3,985
* Grant supporting more than one individual user.								

Grant No. RRO0311-05
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SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROFILES
Period Covered 4/17/70 - 4/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Cate- gory	COMPUTER EQUIPMENT		
			Identification Number	Agency		Terminal Access Minutes (K mins)	Pageminutes (K)	Block Storage (K)
Student Education, Lipp, M.	Medical School -- Medical Student	Category 4 (FREE) Survey of medical students and graduate physicians regarding their experience with and opinions of marijuana.	*RR00311	NIH	4	21.617	102.762	12.216
Miller, S.	Medical Student	Computer diagnosis of liver and cardiac disease.	*RR00311	NIH	4	0.372	2.275	9.358
Nestor, L.	Medical Student	Establishment of computer-based program aimed at differential diagnosis.	*RR00311	NIH	4	5.137	19.092	1.473
McLe, G.	Medical Student	Perform statistical analysis of hemodynamic parameters.	*RR00311	NIH	4	13.695	21.131	0.353
Nuwer, M.	Medical Student	Modeling the operations of large sets of neurons to approximate the action of the nervous system.	*RR00311	NIH	4	0.0	0.0	0.002
Odell, R.	Medical Student	Studies on the interaction of hormonal and neural events to discover signals in the operation of the physiological system.	*RR00311	NIH	4	0.0	0.0	0.004
Peters, D.	Medical Student	Formulation of a comprehensive model for insulin metabolism within the human body.	*RR00311	NIH	4	8.910	32.906	0.358
Peters, J.	Medical Student	Evaluation of residuals and outliers in parallel line assays.	*RR00311	NIH	4	20.520	68.542	2.225
Pope, S.	Medical Student	Statistical analysis of data sets of cardio- vascular function parameters of various pharmacologic agents.	*RR00311	NIH	4	2.205	3.950	0.353
Portlock, C.	Medical Student	Study of motivations for pregnancy.	*RR00311	NIH	4	0.0	0.0	0.012
Propper, R.	Medical Student	Study of inter-relationship of angiogenesis glucomedogenesis in the perfused kidney.	*RR00311	NIH	4	0.080	0.096	0.327
Paybin, D.	Medical Student	Calculate results of assays and handle other data calculations, statistics, etc.	*RR00311	NIH	4	5.290	9.009	0.102
Rosenfeld, R.	Medical Student	Studying the psychophysiological adaptation of male patients to the Coronary Care Unit.	*RR00311	NIH	4	0.0	0.0	0.024
Rosenthal, W.	Medical Student	Speech and language pathology; normal speech perception.	*RR00311	NIH	4	0.057	0.113	0.617
Sachs, D.	Medical Student	Studies on ecology and population biology.	*RR00311	NIH	4	39.210	91.692	16.126
Saffir, A.	Medical Student	Computer instruction in biostatistics for dental students.	*RR00311	NIH	4	1.352	2.211	0.008
Scandella, C.	Medical Student	Studying a phospholipase enzyme which has been purified from cell membranes.	*RR00311	NIH	4	17.375	28.277	1.057
Schwartz, B.	Medical Student	Statistical modeling of the growth, devel- opment, and ultimate senescence of cultured human fibroblasts.	*RR00311	NIH	4	0.600	1.156	0.093
Sethi, S.	Medical Student	Studies on the replication of rhinoviruses.	*RR00311	NIH	4	0.850	2.083	0.912
* Grant supporting more than one individual user.								

Grant No. RR00311-05
Section IX

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER REQUESTS
Period Covered 11/17/70 - 11/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Cate- gory	COMPUTER EQUIPMENT			
			Identification Number	Agency		Annual Amt.	Terminal Access Minutes (X min)	Pageminutes(K)	Block Storage(K)
Student Education,	Medical School --	Category 4 (FREE)							
Sinclair, A.	Medical Student	Measurement of intervals between beats of individual heart cells and administering drugs to cells to change environmental conditions.	*RRO0311	NIH	4	4,470	9,870	0.443	
Smith, R.	Medical Student	Experimental study of family structure; socio-physiological studies of kidney transplant patients.	*RRO0311	NIH	4	0.0	0.0	0.604	
Swanson, G.**	Medical Student	Interpret therapeutic drug action on respiratory control.	*RRO0311	NIH	4	138,842	631,767	27,342	
Thomas, H.	Medical Student	Student decisions under a time constraint.	*RRO0311	NIH	4	1,645	3,114	0.112	
Wiskocil, B.	Medical Student	Studying the enzyme mechanism of tryptophan synthesis; using equilibrium dialysis technique.	*RRO0311	NIH	4	0.0	0.0	0.009	
Core Research, Real	time -- Category 5	(FREE)			5				
Reynolds, W.**	Genetics	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analyses.	*RRO0311	NIH	5	89,817	257,154	18,445	
Ross, R.**	Chemistry	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analyses.	*RRO0311	NIH	5	55,612	578,243	15,123	
Stillman, R.**	Chemistry	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analyses.	*RRO0311	NIH	5	33,442	166,208	10,430	
Core Research, Routine	Terminals -- Category 6	(FREE)			6				
Cohen, S.**	Clinical Pharmacology	Establishment of computer-based program aimed at preventing undesirable drug interactions.	*RRO0311	NIH	6	100,985	391,933	20,141	
Reynolds, W.**	Genetics	Recording of high and low resolution mass spectra; computer control of the operating parameters of mass spectrometers.	*RRO0311	NIH	6	9,112	46,108	0,300	
Ross, R.**	Chemistry	Recording of high and low resolution mass spectra; computer control of the operating parameters of mass spectrometers.	*RRO0311	NIH	6	23,067	105,109	2,125	
Stefik, M.**	Genetics	Development of programs for Mass Spectrometer; Mass Spectrometer will be used for deducing molecular structure.	*RRO0311	NIH	6	39,757	177,200	2,088	
Stillman, R.**	Chemistry	Development of programs for Mass Spectrometer.	*RRO0311	NIH	6	15,052	73,844	0,400	
* Grant supporting more than one individual user. **Part of core research.									

* Grant supporting more than one individual user.
**Part of core research.

Grant No. RPO0311-05
Section IX

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/17/70 - 4/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Cate- gory	COMPUTER EQUIPMENT		
			Identification Number	Agency		Terminal Access Minutes (x mins)	Pageminutes(K)	Block Storage(K)
Stanford Medical School,	Clinic Billing	Office -- Category 8 (TOTAL)	University Funds	University Operating Account	8		at .1-1/4 cents per pageminute	at .10 cents per block
Boyle, J.	8				246.112	1399.622	93.747	

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SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/17/70 - 4/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Category	COMPUTER EQUIPMENT		
			Identification Number	Agency		Terminal Access Minutes (4 min)	Pages/minutes (K)	Block Storage (K)
Pilot Project, Routine	Real time -- Category 11 (FREE)							
Fady, D.	Cardiovascular Surgery	Development of an optimization technique for control of infectious diseases.	*RR00311	NIH	11		at 1 cent per page/minute	at 10 cents per block
Goldstein, A.	Pharmacology	Periodic data summation and statistical tests on the use of methadone in treating heroin addicts.	*RR00311	NIH	11	0.0	0.0	0.002
Henry, P.	Psychiatry	Development of pattern recognition subroutines to identify and count monophasic sharp waves recorded from the lateral geniculate during sleep.	*RR00311	NIH	11	12.627	65.424	1.621
Hillman, R.	Psychiatry	Construct computerized psychiatric "patient."	*RR00311	NIH	11	4.842	16.424	1.079
Hirschfeld, R.	Psychiatry	Applications of Bayes' Theorem to psychiatric diagnosis.	*RR00311	NIH	11	0.732	1.902	0.146
Kallman, R.	Radiobiology	Analysis of tumor blood flow data from experiments on rodent tumors.	*RR00311	NIH	11	7.915	17.072	5.667
Korn, D.	Pathology	Data retrieval of autopsy records.	*RR00311	NIH	11	7.192	12.957	2.759
Leiderman, E.	Psychiatry	Analysis of data collected from a village in Kenya on physical, psychological, and social growth of infants during their first year of life.	*RR00311	NIH	11	13.662	27.976	15.730
McGaug, L.	Community and Preventive Medicine	Survey of Stanford Medical Center hospital charges for the aged.	*RR00311	NIH	11	0.0	0.0	0.004
Morrell, L.	Neurology	Multivariate statistical evaluation of data relating electroencephalographic measures to motor behavior.	*RR00311	NIH	11	2.900	9.206	6.207
Steward, P.	Radiology	Studying the kinetic responses in tumor and normal tissues; determination of the most promising radiochemotherapy protocols.	*RR00311	NIH	11	6.767	19.254	0.847
						119.825	428.667	55.522
						SUB-TOTAL		
Funding Anticipated,	Real time -- Category 12 (FREE)							
Constantinou, C.	Urology	Studies on the improvement of clinical appraisal, follow up and management of patients with neurogenic bladder dysfunction.	*RR00311	NIH	12	97.052	314.048	11.562
Gersch, W.	Neurology	Research in the application of time series methods to problems in neurophysiology and medicine.	*RR00311	NIH	12	63.675	344.476	17.524
Glaze, R.	Cardiovascular Surgery	Computation of data obtained from experiments on the vagal-cardiac rate system of dogs.	*RR00311	NIH	12	12.507	80.054	5.074
Govar, D.	Urology	Information storage and retrieval of data on patients with spinal cord injury or disease.	*RR00311	NIH	12	52.985	212.734	10.115
Thathachari, Y.	Dermatology	Generation of models of the molecular structure of melanins.	*RR00311	NIH	12	39.945	197.193	3.043
						266.165	1148.506	47.318
						SUB-TOTAL		

Grant No. RR00311-C5
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SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/17/70 - 4/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT Identification Number	Agency	User Category	Terminal Access Minutes (k mins)	COMPUTER EQUIPMENT Page/minutes(K)	Block Storage(K)
Funding Anticipated, Category 13 (FREE)							at .1 cent per page/minute	at .10 cents per block
Cann, H.	Routine Terminals	Investigation of factors which affect frequencies of genes controlling various human heritable characters.	*RRO0311	NIH	13	6.875	19.237	0.280
Cann, H.	Pediatrics	Investigation of factors which affect frequencies of genes controlling various human heritable characters.	*RRO0311	NIH	13	74.107	231.296	16.944
DeFardo, G.	Nuclear Medicine	Using radioactive methods to assess regional distribution of ventilation and pulmonary blood flow.	*RRO0311	NIH	13	0.642	0.965	0.691
Doherty, R.	Pediatrics	Random sampling of cells; statistical evaluation of data.	*RRO0311	NIH	13	26.375	87.315	19.739
Kopell, B.	Psychiatry	Relationship between average evoked potential expectancy wave, and EEG in humans.	*RRO0311	NIH	13	14.445	61.773	6.099
Saunders, A.	Pathology	Chemistry of single cell; maturation and biology of mast cell.	*RRO0311	NIH	13	0.0	0.0	0.006
Saunders, A.	Pathology	Measurement of cells by a rapid censor system.	*RRO0311	NIH	13	0.0	0.0	0.633
Savageau, M.	Cardiology	Kinetic behavior of enzyme catalyzed reactions.	*RRO0311	NIH	13	0.737	1.588	0.122
						123.202	402.175	44.514
						SUB-TOTAL		
Suspended Pending Individual Institute Approval -- Category 14 (TOTAL)							at .01/2 cent per page/minute	at .10 cents per block
Bunnenberg, F.	Chemistry	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analysis.	*GML2173	NIH	14	0.130	0.202	2.003
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analysis.	*GML2173	NIH	14	0.005	0.008	3.705
Bunnenberg, F.	Chemistry	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analysis.	*GML2173	NIH	14	1.997	3.442	0.059
Dong, E.	Cardiovascular Surgery	Effects of heart transplants; white cell correlations; pulmonary data collection.	PH436711	NIH	14	41.682	179.069	11.592
Dong, E.	Cardiovascular Surgery	Development of a controller for an artificial heart.	PH436711	NIH	14	39.887	380.119	10.001
Duffield, A.	Chemistry	Analysis of mass spectra and spectropolarimeter spectra; routine chemical analysis.	*GML2173	NIH	14	7.575	116.214	2.293
Warrick, G.	Psychiatry	Analysis of continuous EEG for averaged evoked responses.	*MHC0976	NIDM	14	0.0	0.0	0.029
Wittner, W.	Psychiatry	Influence of correctly and incorrectly guessed visual patterns on visual average evoked response.	*MHC0976	NIDM	14	0.005	0.007	0.012
						91.263	679.063	29.624
						SUB-TOTAL		
* Grant supporting more than one individual user.								

Grant No. RRO0311-05
Section IX

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/1/79 - 4/30/79

Grant No. RR00311-05
Section IX

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT Identification Number	Agency	Current Annual Amt.	User Cate- gory	Terminal Access Minutes (k mins)	COMPUTER EQUIPMENT at .1 cent per page minute	Block Storage(k)
Suspended Pending	Institute Approval, Routine Terminals -- Category 15 (TOTAL)					15			
Bernfield, M.	Pediatrics	Biochemistry in birth defects.	HD02147	NIH	\$198,232.79	15	0.382	1.308	0.244
Efron, B.	Community and Preventive Medicine	Theoretical and applied research in bio- statistics.	GM14554	NIH	2,740.46	15	7.820	17.135	0.632
Hahn, G.	Radiology	Study of radiochemotherapy of mammalian cell cultures.	*CA04542	NIH	10,780.23	15	0.230	0.605	0.264
Hill, F.	Psychiatry	Interactive on-line psychological testing.	*MH11028	NIH	54,863.08	15	0.042	0.042	1.666
Smith, P.	Anesthesia	Premature or sick newborn infant research.	RR00081	NIH	163,057.22	15	0.002	0.000	0.632
Stillman, R.	Psychiatry	Interviewing and testing psychiatric patients.	*MH11028	NIH	54,863.08	15	0.050	0.148	1.488
					SUB-TOTAL		8.527	19.153	4.926
					TOTAL		1720.520	17522.459	942.202

Grant No. RR00311-05
Section IX

* Grant supporting more than one individual user.

* Grant supporting more than one individual user.

SUMMARY OF COMPUTER RESOURCE USAGE
OTHER USE (Non-health related use)
Period Covered 4/17/70 - 4/16/71

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		User Cate- gory	COMPUTER EQUIPMENT		
			Identification Number	Agency		Terminal Access Minutes (k mins)	Pageminutes (k)	Block Storage(k)
Stanford Non-Medical	School and Non-Biomedical Research	-- Category 9 (TOTAL)						
Astro, A.	Aero and Astro				2		1.432	at .10 cents per block
Astro, A.	Aero and Astro				9	0.435	24.923	0.659
Balcer, Y.	Operations Research				9	7.575	0.0	1.764
Boyd, W.	School of Law				9	0.0	34.248	0.002
Brown, S.	Psychology				9	4.835	0.0	0.342
Fork, D.	Carnegie Institute				9	0.0	2.051	0.006
Greene, D.	Psychology				9	1.292	0.469	0.482
Gustavson, D.	Stanford Linear Accelerator Center				9	0.265	93.947	0.013
Hardwick, J.	School of Business				9	39.610	0.0	10.215
Harris, W.	Philosophy				9	0.0	0.0	0.010
Jacklin, C.	Psychology				9	0.0	2.490	0.005
Johansen, D.	Aero and Astro				9	1.732	17.976	0.036
Jurrow, J.	Stanford Linear Accelerator Center				9	9.492	6.110	1.961
Lepper, M.	Psychology				9	4.140	0.114	1.538
Maccoby, E.	Psychology				9	0.080	0.227	0.015
Margel, D.	Materials Science				9	0.165	0.819	0.017
McCormell, H.	Chemistry				9	0.380	120.825	0.060
Naumes, W.	School of Business				9	19.122	28.064	0.152
Nelson, K.	Psychology				9	8.042	0.254	2.874
Patterson, F.	Psychology				9	0.182	0.067	0.013
Rees, J.	Stanford Linear Accelerator Center				9	0.045	21.751	0.006
Richter, B.	Stanford Linear Accelerator Center				9	11.057	23.287	1.207
Ritson, D.	Physics				9	11.545	55.160	4.190
Saal, H.	Stanford Linear Accelerator Center				9	30.217	0.716	3.250
Schawlow, A.	Physics				9	0.182	0.639	0.413
Sears, R.	Psychology				9	0.317	1.975	0.443
Sears, R.	Psychology				9	1.407	0.716	0.036
Shapiro, S.	Statistics				9	0.510	3.528	0.042
					9	1.237		0.160

Grant No. HR00311-05
Section IX

Grant No. RR00311-05
Section IX

Grant No. BR00311-05
Section IX

(110)

X. MEDICAL CENTER SURVEY

RESULTS OF "SURVEY OF COMPUTER AND DATA PROCESSING NEEDS AT THE STANFORD MEDICAL CENTER -- NOVEMBER, 1970"

A survey was conducted in November and December, 1970, to determine the nature of current and future computing requirements in the Stanford Medical Center. Questionnaire forms were mailed to all department heads along with requests for future distribution within each department. Sixty-three forms were returned and incorporated into the following data.

Responses came from the following sources:

<u>Qty.</u>	<u>Department</u>
13	Hospital Administration
1	Anesthesia
1	Biochemistry
4	Community and Preventive Medicine
3	Genetics
3	Medical Microbiology
8	Medicine
3	Neurology
1	Pathology
4	Pediatrics
4	Psychiatry
5	Radiology
9	Surgery
4	Other Campus Departments
<hr/> 63	TOTAL

Brief summary statements of results are presented below:

1. About one-half of the respondents noted that the most important computer use to them was "general program development" or "routine calculations (super desk calculator)." This indicates that many users needs might be solved by compilers such as BASIC or APL. One third of the respondents felt that "automation of current laboratory or clinical procedures" was of priority "1", "2", or "3" on a scale of "6". About 16% felt that the automation of laboratory or clinical procedures was of highest priority.

X. MEDICAL CENTER SURVEY

2. Of those responding, about 50% were current users of ACME, 20% of Hospital ADP, and 20% of Campus Facility. Ten persons or 16% indicated ownership of a dedicated system.
3. 58% use the PL/ACME language. 21% use no computer language at present or left the question unanswered.
4. 75% indicated plans to replace an existing manual system with an automated system; but the automated one will add new capabilities.
5. 70% indicated the applications were running now; 33% stated that future applications were planned. This was essentially corroborated by another question in which 43 persons stated that programs were already available and 19 indicated programs were not yet available.
6. The single largest limitation on achievement of computing goals was "Your own time or direct knowledge in this field." Other choices available on the form were hardware, system software support, and skilled applications staff.
7. Instrument readings and Laboratory reports were the two most commonly checked sources of data for respondents. These selections were followed by personal interaction and medical records. The items checked by the fewest were doctor's orders, verbal reports from staff, and patient charts.
8. Source of funding data revealed 21 from National Institutes of Health, 12 from Hospital or Medical Center budgets, 5 from private organizations and gifts, 7 from "Other", and 18 who skipped the question without answering.
9. The amount of funding available for computing was left unanswered by 45 of the 63 persons. Of the others, 10 reported \$0 to \$10,000; 5 reported \$11,000 to \$20,000; and 3 indicated over \$35,000 per year.
10. Twenty responders or roughly one-third reported plans for real-time data acquisition or instrumentation control.
11. Several persons indicated more than one choice on staffing plans. Total responses were 25 to hire own staff, 32 to use staff from central facilities, 2 to use commercial firms, and 18 to "do my own programming".
12. Most respondents felt that computer unavailability could be tolerated for four hours or more. Only 4 persons indicated that downtime on the order of minutes was unacceptable. Slightly more than one-half reported that manual back-up procedures would be essential.

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13. In response to the question, "Is your data used to prepare patient billings?" answers were 9--Yes, 48--No, and 6--No response.

14. Nearly three-fourths of the respondents indicated no contribution of information to the patient medical record.

15. Concerning the sharing of information, 36 replies reported sharing of data with less than 5 other persons, while only 9 reported sharing with more than 15 persons.

16. One half of the sample would like to receive the bulk of their data on alphanumeric displays. The second most popular selection of ourput media was printed reports on special forms.

17. 24 persons stated that special precautions would be required for their files due to standard practices, legal, or audit considerations.

18. Access to filed data must require a few minutes or less according to about 70% of the sample.

Analysis of Medical Center Computer Capability Requirements

A more subjective analysis of the survey data written by Tim Coburn 5th year medical student, is presented here.

The problem facing the Stanford Medial Center can be considered as a question of how to best invest roughly two million dollars a year over the next five years in information processing services.

I. The survey has indicated that the requirements or applications for computer capability at the Medical Center fall into eight general categories:

<u>Requirements</u>	<u>Basic Parameters</u>
1. Reduction of physiologic data	a,e
2. Reduction of chemical data	a,d
3. Machine retreivable storage, "library"	b,e
4. Super calculating machine	c
5. Pattern recognition	a,c,e
6. Accounting and administrative	b,e
7. Modeling and simulation	b,e
8. Process control	d

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The most basic parameters of computer systems are:

- a. high, or rapid input
- b. high output
- c. sophisticated computational capability
- d. fast response time
- e. large storage facility

All of these parameters are generally desirable, but they are desirable to different degrees for different applications. The small letters following the eight types of applications denote the more important parameters for the particular type. The parameters to be emphasized are: High input, high output, and large storage capability.

II. Which parameters should a medical center computing capability be designed to emphasize or not to emphasize.

A. Not the super calculating machine applications. These can be handled by the main Campus Facility which is indeed designed for this type of use.

B. Not the pattern recognition applications. Sophisticated types of pattern recognition are still quite esoteric in medical research and treatment. There are other facilities at Stanford where these interests can be pursued.

C. Not modeling and simulation problems. Here again these applications are too sophisticated to merit primary consideration in design of a general system.

D. Not reduction of chemical data. Problems in this area are currently engineering, design of suitable transducers, rather than computer problems.

E. Not process control. These are also engineering problems even though their solution may incorporate computer capability of a fairly trivial nature.

The primary applications for design consideration are therefore: physiologic data reduction, library storage, and accounting.

III. What are reasonable levels of these primary design parameters?

A. Input requirements can be roughly approximated by estimating 20 patients or subjects monitored by 5 sensors at 1 kc per sensor. Total input capability needed = 100 kc bytes continuous.

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B. Storage capability can be similarly approximated.
100 kc x 60 seconds/minute x 60 minutes/hour x 8 hours x 200 days.
Total storage requirements per year = 5×10^{11} bytes.

C. Output requirements may be estimated by assuming 100 users each capable of absorbing data at 1 kc.
Total output needs = 100 kc bytes continuous.

IV. Cost and feasibility of meeting these needs.

A. The input/output needs could be satisfied by a completely decentralized system of 100 small computers, but this would only provide about 10^8 bytes of storage. The cost would be roughly 40k per computer per year averaged over 5 years. This includes software.
Total cost of completely decentralized system = 4 million/year.

B. The present cost of computer capability is roughly 2 million/year.
1.5 million = ACME and Hospital Data Processing Systems.
.5 million = Small computers and their software.

C. The design problem consists, then of achieving a 2 to 1 reduction in cost over the decentralized system, and an increase in on-line storage capability of at least 10^3 .

- 1) Achieving a 2 to 1 reduction in cost is very largely a problem of software personnel (with engineering support). It is a question of 50 rather than 100 people at an average cost of 20k.
- 2) Storage capability in the range of 10^{11} bytes is a major problem. Standard IBM tape units are too small by a factor of 1,000. There may be high density optical systems available (see Precision Instruments Unicon).
- 3) Other hardware design problems should not be too difficult, although an overall system concept may be unfamiliar to many "computer" people.

V. Conclusion.

Centralization of the Medical Center storage facilities could provide a significant gain in cost per unit of data accessible, assuming that the foregoing I/O requirements and size of storage are achieved. However, even with these assumptions, careless design and implementation or external pressures could quickly reduce the net gain to zero or worse. The probability of a net gain from centralization without meeting the above I/O requirements or storage size seems unlikely.

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COMPARISON OF ACME FACILITY 360/50
MEAN TIME BETWEEN FAILURES
FOR JULY 17, 1969 - APRIL 16, 1971
(IN HOURS)

<u>HARDWARE</u>	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Annual Average
1969-1970:	<u>113.3</u>	<u>55.3</u>	<u>25.2</u>	<u>31.3</u>	<u>56.0</u>	<u>167.3</u>	<u>47.4</u>	<u>39.5</u>	<u>58.7</u>	<u>59.6</u>	<u>83.0</u>	<u>34.5</u>	<u>64.3</u>
1970-1971:	<u>72.4</u>	<u>36.4</u>	<u>176.0</u>	<u>362.0</u>	<u>704.0</u>	<u>104.0</u>	<u>218.7</u>	<u>364.0</u>	<u>182.0</u>	<u>*246.6</u>	<u>*246.6</u>	<u>*246.6</u>	<u>*246.6</u>

ALL FAILURES INCL. HARDWARE

	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Annual Average
1969-1970:	<u>40.0</u>	<u>33.2</u>	<u>17.7</u>	<u>26.5</u>	<u>48.0</u>	<u>44.0</u>	<u>39.0</u>	<u>25.2</u>	<u>27.0</u>	<u>29.8</u>	<u>60.4</u>	<u>22.6</u>	<u>34.4</u>
1970-1971:	<u>29.0</u>	<u>24.3</u>	<u>54.1</u>	<u>181.0</u>	<u>234.7</u>	<u>38.3</u>	<u>54.7</u>	<u>80.9</u>	<u>66.2</u>	<u>*84.8</u>	<u>*84.8</u>	<u>*84.8</u>	<u>*84.8</u>

CONCLUSION: MTBF for hardware improved by a factor of 4. MTBF for the ACME system for all reasons including hardware failures improved by a factor of 2.5!

Underlined Figures = Best mean time to failure as compared to same month of each year.

* (May - July, 1971) Projected mean time to failure based upon first nine months total of August 1970 through April 1971.